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PAPERS
IN
AGRICULTURE.

AGRICULTURE.

The GOLD MEDAL *of the Society was this Session voted to* JOHN CHRISTIAN CURWEN, Esq. M. P. *of Workington Hall, in Cumberland, for the following* AGRICULTURAL COMMUNICATIONS *on his* CULTURE of CARROTS, *his Method of* FEEDING MILCH COWS *in Winter, and on his* DRILL HORSE HOE.

Account of Mr. CURWEN'S *Method of* CULTIVATING CARROTS, *and applying them as* FOOD *for* CATTLE.

DEAR SIR,

IF you judge the subjoined account of the Culture of Carrots deserving the attention of the Society, I will beg you to submit it to their inspection; with many thanks for your kind attentions.

I am, Dear Sir,
Your obedient Servant,
J. C. CURWEN.

Workington Hall, Dec. 14, 1805.

To DR. C. TAYLOR.
Secretary to the Society of Arts, &c.
Adelphi, London.

SIR,

IN Mr. A. Young's valuable and interesting Report on the Agriculture of Suffolk, I was much struck with his account of the culture of carrots, and the advantages resulting from the application of them as food for horses.

From the very general opinion which prevails, that none but particular soils are applicable to the growth of carrots, the culture of them to any extent has been confined to small districts. I presume, therefore, that it may not be unacceptable to the Society to be informed of the success of trials in this matter upon a stiff loam, partaking, in a great measure, of clay.

Mr. Young's observations are confined to sowing by broad-cast, which can be successful solely in sandy soils. The method I have pursued has been to trench plough, and stitch up the ground intended for carrots, as soon as it was clear, leaving it in that state during winter, which greatly facilitates its working in the spring. In April I break it up by giving it three or four ploughings, harrowings, and rakings, which bring it into garden tilth. Previous to the last ploughing I give from ten to fifteen cart loads of ashes per acre. The second week in May I have it stitched up, and made ready for sowing; allowing three feet between each stitch; and I throw the ridges as high as they can be put. The tops of the stitches are smoothed with a very light roller, so as to admit of a furrow being drawn with a hand hoe.

The seed, ten days or a fortnight before it is used, is mixed with wet sand, and placed in some warm situation, so as to be in a full state of vegetation before it is sown. A fortnight is gained by this method, and the carrots are less liable to be injured by the weeds. The plough and harrow are kept at work during the whole summer. The plants are twice hand-weeded, and afterwards thinned. The expense attending this is considerable, but the value of the crop amply compensates it.

In 1804 I had an acre and a rood, which had been previously occupied by cabbages, and afterwards by tares. The soil was very heavy and strong. The tops of this crop were so abundant, that they would have fed twenty head of cattle for a month. I began cutting them too late, by which means I lost a great part. It is essentially necessary to get the carrots dry, to enable them to keep. I endeavour, if the weather be favourable, to have them up by the first or second week in October. I employ women to take them up with forks, which costs 10*l.* The crop yielded 829 Winchester bushels, equal to 4143 stone (of 14 pounds). Estimating the carrots at 6*d.* per stone (the price of oats at that time) they were worth to me 103*l.*

Each working horse in my employ is allowed 8*lb.* of oats per day. One half was taken away, and supplied by an equal weight of carrots, and this was continued while they lasted. The general opinion was, that the horses improved in their condition upon this food.

In 1805 I had three acres and three roods of a similar soil sown with carrots, which had previously borne a crop of oats. The first part of the season was uncommonly cold, and afterwards unusually wet, which checked the growth of the tops, so that they never got to any size, and were eaten off by sheep. In order to facilitate the work, and at the same time to save expense, I made a trial of the plough to take off the earth from the carrots, and then setting in and turning them up.

The injury was trifling, and the expense not a tenth part what it had been. There were 108 carts of 80 stone each, or 2246 stone per acre, which, at 6*d.* per stone, would amount to 60*l.* and upwards per acre. I have made use of them as in the preceding year, with the most complete success, and saved 60 bushels of oats per week, and shall be able to continue to do so for a fortnight or three weeks longer.

In the first trial an acre of carrots was equal in food to 23 of oats, allowing 60 Winchester bushels of oats per acre, and at three stone the bushel. On taking up the carrots a small piece was cut from the top of each, to prevent it from vegetating, and these were immediately used. The remainder were piled in rows two feet thick, and five feet high, leaving a space between each row for a free circulation of air. I do not doubt but that they would keep in this way for a length of time. I have always made immediate use of them, as old oats are more valuable than new, and moreover, the saving of oats is in itself a matter of much import.

The success of these trials has determined me to extend the cultivation of carrots, and I have prepared ten acres for the ensuing season.

Mr. Young recommends carrots as a substitute for hay: when they can be procured with little or no expense, this may answer; but when the ground is to be prepared for them at a considerable expense, cheaper substitutes may be found. Though the expenses are great in cultivating carrots, yet the giving of them in part instead of oats, will most abundantly repay them. The expense of each acre in sowing, cleaning, and housing, will not be short of 15*l.*

Whatever system can multiply the produce of one acre into that of two or more, is, I conceive, an object to a country where the consumption of the first necessary of life exceeds what is at present produced within the empire. In this point of view I flatter myself that the present paper may not be thought unworthy the attention of the Society.

We, ISAAC KENDALL, bailiff, and THOMAS MOORE, groom, to J. C. CURWEN, Esq. do certify, that Mr. Curwen's working horses had 4*lb.* of carrots given them in the room of so much oats, from October 1805 to January 1806, being three months: that without the use of carrots Mr. Curwen allows his working horses from 8 to 12*lb.* of oats per day, according to the size and work of the horses; that the carrots answered every purpose, and that the horses were never in better condition than at the time when they were in use; and we believe that they would not have been better, nor fitter for work, with the whole allowance of oats; that the crops of carrots have been extremely good by Mr. Curwen's mode of management. The saving of oats was 58 Winchester bushels per week by the use of carrots upon the food of 76 horses.

Workington, May 10, 1806.

Account of Mr. CURWEN'S METHOD *of* FEEDING COWS, *during the Winter Season, with a View to provide poor Persons and Children with Milk at that Time.*

SIR,

EVERY attempt to ameliorate the condition of the labouring classes of the community is an object not unworthy of public attention; and has on all occasions been zealously patronised by the Society of Arts. Under this impression I hope for the indulgence of the Society in calling their attention to an experiment, which I flatter myself will in its consequence prove not only highly beneficial to the lower orders of society, but tend likewise to the advancement of agriculture.

There is not any thing, I humbly conceive, which would conduce more essentially to the comfort and health of the labouring community and their families, than being able to procure, especially in winter, a constant and plentiful supply of good and nutritious milk. Under this conviction, much pains have been taken to induce the landed proprietors to assign ground to their cottagers, to enable them to keep a milch cow. The plan is humane, and highly meritorious; but unfortunately its beneficial influence can reach but a few. Could farmers in general be induced from humanity, or bound by their landlords to furnish milk to those, at least, whom they employ, it would be more generally serviceable. Even those who have the comfort of a milch cow would find this a better and cheaper supply, as they can seldom furnish themselves with milk through the winter. The farmer can keep his milch cows cheaper and better; for, besides having green food, his refuse corn and chaff of little value, are highly serviceable in feeding milch cows.

My object is to combat the prevailing opinion, that dairies in summer are more profitable than in winter. I confidently hope to establish a contrary fact. The experiment I am about to submit to the Society, is to prove, that by adopting a different method of feeding milch cows in winter, to what is in general practice, a very ample profit is to be made, equal if not superior to that made in any other season.

I believe the principle will hold good equally in all situations: my experience is confined to the neighbourhood of a large and populous town.

The price of milk is one-fifth higher in winter than in summer. By wine measure the price is 2*d.* per quart new milk, 1*d.* skimmed.

My local situation afforded me ample means of knowing how greatly the lower orders suffered from being unable to procure a supply of milk; and I am fully persuaded of the correctness of the statement, that the labouring poor lose a number of their children from the want of a food so pre-eminently adapted to their support.

Stimulated by the desire of making my farming pursuits contribute to the comfort of the public, and of those by whose means my farm has been made productive, I determined to try the experiment of feeding milch cows after a method very different to what was in general practice. I hoped to be enabled thereby to furnish a plentiful supply of good and palatable milk, with a prospect of its affording a fair return of profit, so as to induce others to follow my example.

The supply of milk, during the greatest part of the year, in all the places in which I have any local knowledge, is scanty and precarious, and rather a matter of favour than of open traffic.

Consonant with the views I entertained of feeding milch cows, I made a provision of cabbages, common and Swedish turnips, Kholrabi, and cole seed. I made use also of chaff, boiled, and mixed, with refuse grain and oil cake. I used straw instead of hay for their fodder at night.

The greatest difficulty, which I have had to contend with, has been to prevent any decayed leaves being given. The ball only of the turnip was used. When these precautions were attended to, the milk and butter have been excellent.

Having had no previous knowledge of the management of a dairy, my first experiment was not conducted with that frugality requisite to produce much profit.

I sold the first season, between October 1804 and the 10th of May 1805, upwards of 20,000 quarts of new milk. Though my return was not great, I felt a thorough conviction that it proceeded from errors in the conduct of the undertaking, and that, under more judicious management, it would not fail of making an ample return, which the subsequent experiment will prove. In the mean time I had the satisfaction of knowing, that it had contributed essentially to the comfort of numbers.

In Oct. 1805, my dairy recommenced with a stock of 30 milch cows; a large proportion of these were heifers; and in general the stock was not well selected for giving milk; for they were purchased with a view of their being again sold as soon as the green crop should be exhausted. If the plan be found to answer under such unfavourable circumstances,

cumstances, what may not more experienced farmers expect?

By the end of this present month I shall have sold upwards of 40,000 quarts of milk.

The quantity of food, and its cost, are as follow. The produce of milk from each cow upon 200 days, the period of the experiment, is calculated at no more than 6 wine quarts in the 24 hours: this is to allow for the risk and failure in milk of some of the heifers. A good stock, I have no doubt, would exceed 8 quarts in the two meals, which would add 100*l.* to the profit.

Daily cost of feeding one milch cow:

	£.	s.	d.
Two stone of green food (supposing 30 tons of green crop on an acre at ¼*d.* per stone would pay 5*l.* per acre) at ¼*d.* per stone of 14*lb.* - -	0	0	0½
Two stone of chaff boiled, at 1*d.* per stone -	0	0	2
Two *lbs.* of oil cake at 1*d.* per *lb.* costing from 8*l.* to 9*l.* per ton - - -	0	0	2
Eight *lbs.* of straw at 2*d.* per stone - -	0	0	1
	0	0	5½

The chaff, beyond the expense of boiling, may be considered as entirely profit to the farmer; 2*d.* per stone for straw likewise leaves a great profit. Turnips also pay the farmer very well at ¼*d.* per stone.

Expense of feeding one milch cow for 200 days, the period upon which the experiment is made:

	£.	s.	d.
200 days keep of one milch cow, at the rate of 5½*d.* per day - - -	4	11	8
Attendance - - -	2	0	0
Supposed loss on resale - - -	2	0	0
	£.8	11	8

Return made of one milch cow in 200 days milking:

	£.	s.	d.
6 quarts per day at 2*d.* per quart, for 200 days	10	0	0
Calf	2	0	0
Profit on 20 carts of manure, 1*s.* 6*d.* each	1	10	0
	13	10	0
Clear gain upon each milch cow	£.4	18	4

This gives a profit upon the whole stock of £.147 10*s.* The profit of another month may be added before a supply of milk can be had from grass, which will make the balance of profit 167*l.* 18*s.* 4*d* This profit, though not as large as it ought to have been, had the stock been favourable for the experiment, far exceeds what could be made of the same quantity of food by fattening cattle. Were the two quarts to be added, which on a moderate computation might be expected, the gain would then be £.267 16*s.* 4*d.* The trifling quantity of land, from which the cattle were supported, is a most important consideration. One half of their food is applicable to no other purpose, and is equally employed in carrying on the system of a corn farm. I have found oil cake of the utmost advantage to my dairy, promoting milk, and contributing greatly to keep the milch cows in condition. The best method of using it is to grind it to a powder, and to mix it in layers and boil it with the chaff: half the quantity in this way answers better than as much more given in the cake, besides the saving of 2*d.* a day on each beast. This I was not aware of on my first trial. The oil cake adds considerably to the quantity and richness of the milk without affecting its flavour. The refuse corn was likewise ground and boiled: it is charged also at 1*d.* per pound. I make use of inferior barley to great advantage. A change of food is much to the advantage of the dairy. Potatoes steamed would answer admirably; but near towns they are too expensive.

By repeated trials it was found that 7 quarts of strippings, wine measure, gave a pound of butter, while 8 quarts of a mixture of the whole milk was required to produce the same weight. Contrast this with milk produced from the feeding of grains, 20 quarts of which will scarce afford a pound of butter.

The Agricultural Report of Lancashire, treating on the milk in the neighbourhood of Liverpool and Manchester, states 18 quarts with a hand churn, and 14 or 15 with a horse churn. In a paper published by the Bath Society, 12 quarts are said to give a pound of butter: but whether ale or wine measure is not specified. A friend of mine, who feeds his milch cows principally on hay, finds 16 wine quarts will not yield more than 17 ounces of butter, and this upon repeated trials.

The milch cows, treated according to my new plan, have been in excellent order both seasons, and are allowed to be superior to any in the neighbourhood.

Cole seed I have found to be the most profitable of all green crops for milk; and it possesses the further advantage of standing till other green food is ready to supply its place.

To ascertain the benefit and utility of a supply of milk both to the consumer and the public will be best done by comparison.

To prove this let us contrast the price of milk with other articles of prime necessity, and consider how far it affords a greater produce from a less consumption of food.

I cannot here omit observing, at a moment when Great Britain can hope for no further supply of grain from the continent, and must look for and depend on her own resources for feeding her population, every mean by which the quantity of victuals can be augmented is an object of great public concern.

Each milch cow yielding 6 quarts of milk per day, furnishes in the period of 200 days 2,400 pounds of milk, or 171 stone of 14 pounds, equal to twice her weight, supposing her in a state fit for killing, with a third less food, and at one half less expense. The milk costs £.10; whilst the same weight of butchers meat at 6*d.* per pound would amount to £.60.

Taking the scale of comparison with bread, we shall find a Winchester bushel of wheat of the usual weight of 4 stone and 4½ *lb.* when manufactured into flour of three sorts yields

Of first flour -	2 st.	9 lb.
Of second - -	0	7 lb.
Of third - -	0	7 lb.
	3	9 lb.
Lost by bran, &c. -	0	9½lb.

The present cost is 10*s.* 3*d.* 2,400*lb.* of the three sorts of flour will cost £.23 3*s.* 9*d.* To make it into bread allow 1*s.* per bushel, which makes the cost of bread £.26 10*s.* 9*d.* or something more than 2½*d.* per *lb.* exceeding twice the price of the same weight of milk. To furnish 2,400 *lbs.* of bread requires 47 bushels, or the average produce of two acres of wheat.

Three acres of green food supplied 30 milch cows with 2 stone each of green food for 200 days. Two stone of hay each for the same period would have required 75 acres of hay. Chaff can scarcely be considered as of any value beyond the manure it would make, which shows the profit of keeping milch cows in all corn farms.

Certificates of the quantities of milk sold and money received accompany this.

If the Society of Arts, &c. think the experiment worthy their notice and approbation, I shall be highly flattered. At all events I trust they will accept it as a small tribute of respect and gratitude for the many favours conferred upon their

Obedient and very humble Servant,

J. C. CURWEN.

Workington Hall, April 18, 1806.
To Dr. C. TAYLOR, Secretary.

Schoose Farm, April 18, 1806.

I ISAAC KENDAL, Bailiff to J. C. CURWEN, Esq. do certify that the following quantities of milk have been sold from the 1st of October last to the 18th of April 1806.

To Jan. 1, 1806 - -	16,685
From that date to April 18, 1806	22,027
	38,712

	£.	s.	d.
Cash received for new and skimmed milk	320	7	5½
Calves sold - - -	44	0	0
	£.364	7	5½

I conceive the estimate of 5½*d.* per day to be correct.

	£.	s.	d.
200 days keep of 30 cows - -	137	10	0
Cost of attendance - - -	60	0	0
Loss upon re-sale - - -	60	0	0
	£.257	10	0

	£.	s.	d.	£.	s.	d.
Cash received as before	£.364	7	5½			
600 carts of manure at 1*s.* 6*d.*	45	0	0			
				£.409	7	5½
Profit				£.151	17	5½

I believe the above statement to be correct. The condition and health of the milch cows is equal, if not superior, to any in the neighbourhood.

The average of the milk is yet 200 quarts per day, varying with the weather and other accidental circumstances.

Account of Mr. Curwen's Drill Horse Hoe, *or* Weed Harrow.

SIR,

As one great and most important advantage of drill husbandry proceeds from the opportunity offered of cleaning foul grounds, as also of breaking and loosening of stiff soils, to give the power of extension to the roots of grain; whatever can facilitate these operations will, I flatter myself, be deemed worthy of the attention of the Society.

Having hitherto found great difficulty and much labour necessary in accomplishing the cleaning of wheat and other grain, I have been led to make some experiments, and I am sanguine in my hopes that the harrow I send for the inspection of the Society, will be found to accomplish the purpose with greater ease and facility than any thing at present in use.

The simplicity and ease with which it is worked has enabled me, this season, to give my wheat crop, which exceeds one hundred acres, two cleanings, and at an expense of somewhat less than a shilling per acre each operation; a man and boy, with one horse, being able to clean above seven acres per day. The direction of the harrow to prevent its injuring the grain is effected by an alteration of the chain by which it is attached to the wheels. The distance of the teeth from the centre tooth must be regulated by the width of the drills. In case they exceed a foot, the harrow should be broader to admit of another row of teeth. To clean at nine inches, two inches and a half is allowed on each side of the centre tooth, by which means every part of the earth is cut between the rows of grain. The size and strength of the teeth must be regulated by the nature of the soil. The thing is so simple that I hesitated laying it before the Society till I was encouraged by persons whose experience and knowledge is infinitely greater than my own.

The complete introduction of drill husbandry would, I conceive, be of great national importance, and under this conviction whatever can facilitate its operations may not be unworthy of attention, and will, I hope, excuse the liberty I have taken.

I have the honour to be, Sir,
Your obedient humble Servant,
J. C. CURWEN.

London, May 5th, 1806.
To Dr. C. Taylor.

Reference to the Engraving *of Mr.* Curwen's Drill Horse-Hoe *or* Weed Harrow. *Plate* I. *Fig.* 1, 2.

Fig. 1. Shews the carriage within the shafts A, of which the horse is placed: the carriage wheels are intended to be half the width of the butts or stitches, so that once going up and once returning will be sufficient to clear each butt from weeds.

B, The hoe or harrow which is attached to the carriage by the chains C C. The harrow may be raised higher or sunk lower, or placed more on one side or another, as occasion may require, by altering the position of the chain, as will appear by an inspection of the plate.

DDDDDD, Six double rows of teeth or knives which are so placed in the frame that each double row may pass up the interval betwixt the rows of corn, and cut or pull up

Mr. Waistell's Horse Hoe.

Fig. 3.

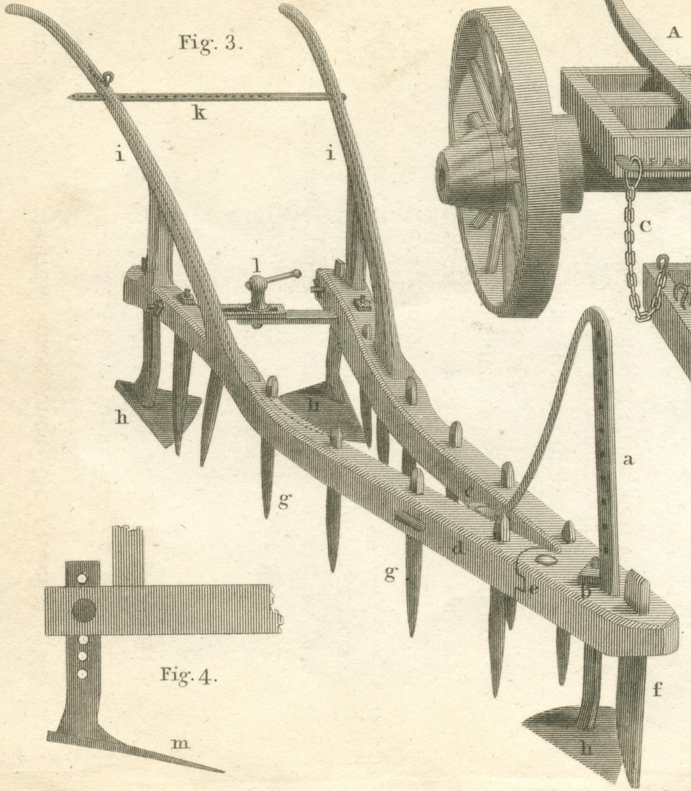
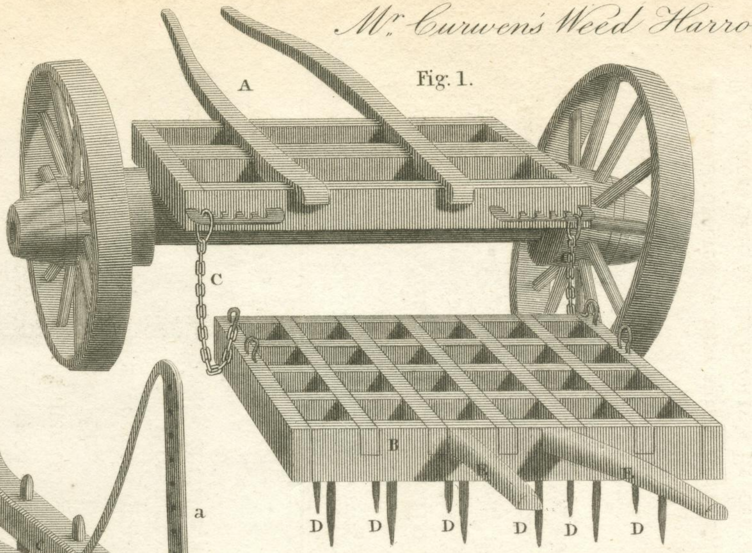


Fig. 4.

Mr. Curwen's Weed Harrow.

Fig. 1.



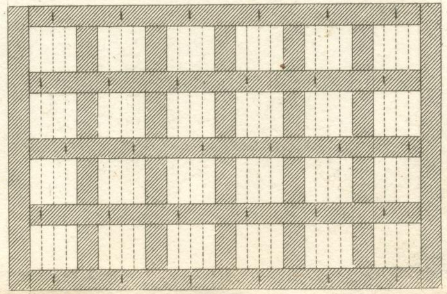


Fig. 2.

C. Varley del.

r sculp.

up the weeds that grow in such intervals without injuring the corn. These knives are strong, and have a sharp edge in front.

E E Are the two handles by which the person who holds them may direct the knives or teeth of the harrow to pass in straight lines up the intervals.

Fig. 2. shews the underside of the weed harrow, that the positions of the double rows of the knives, and of the space left to prevent the corn being injured may be more clearly seen.

Certificates in favour of Mr. CURWEN'S HARROW.

AT the request of J. C. CURWEN, Esq. I beg leave to state that I have been present when Mr. Curwen's harrow for cleaning drilled corn has been used, and have worked a little with it myself; that its effect appeared to me most highly beneficial in clearing away in the spring all the weeds that had grown during the winter amongst the wheat, without the least injury to the grain ; and also in raising up the top soil which had become sad and heavy, and thus enabling the spring shoot to take root more easily: and at the same time it covers the roots of the corn with fresh soil, which are often left quite bare by the washing of the rains in winter, and so subject to be killed by the frost ; it also enables the farmer to sow his barley much earlier than he could broad-east, as it will both clear the corn previous to sowing the grass seeds, and afterwards harrow them in. Its utility in every respect appeared to me so very great, that I was induced to adopt the plan of sowing my corn with the drill upon my fallows this spring, and have accordingly got a harrow made upon the model of Mr. Curwen's.

I have the honour to be, &c. &c.

J. D. B. DYKES.

Dovenby Hall, May 18, 1806.

SIR,

We whose names are hereunto subscribed do certify, that we have paid particular attention to a harrow made use of in the farm of J. C. Curwen, Esq. for the purpose of harrowing between the rows of drilled grain. We conceive it of great utility; the expedition is undeniable, as upwards of seven acres can be done with ease in eight hours, with only a boy to lead the horse and a man to regulate the harrow.

We are, Sir,

Your most obedient humble Servants,

Thomas Gaff, Merchant, Workington Hall Mills.

Matthew Foster, Farmer, at Calva, near Workington.

Workington Hall, May 19, 1806.

To C. Taylor, M. D.

The Drill Culture *of* Turnips *having in this and several preceding Sessions been found superior to the* Broad-cast *Method, the following Account of a* Useful Drill Hoe Harrow, *communicated to the Society by Mr.* Charles Waistell, *No.* 99, *High Holborn, will probably complete the Subject, and render it unnecessary for the Society to offer further premiums for the comparative* Culture *of* Turnips.

DEAR SIR,

I have ordered a new agricultural implement to be left for a short time at the Society's Repository for inspection. It is called a hoe harrow, and is, as its name imports, a hoe and harrow combined. For destroying the weeds, and pulverising the soil in the intervals of drilled turnips, and of other crops drilled sufficiently wide to be horse-hoed, I know not of any other implement of equal efficacy.

It enables the farmer to cultivate those intervals as completely as a well wrought fallow, so long as the horse can travel therein, without injury to the growing crop. I know not who the meritorious inventor is. The first I saw was a few years ago at West Park, near Barnard Castle. This was brought from Carlisle by my brother, and many have been made from that pattern, and are now in use, and are highly approved of by farmers in the neighbourhood of Barnard Castle, where the turnip crops are now generally raised in drills about 27 inches apart. This mode was first introduced there about 23 years ago, before which time they were all sown broad-cast.

An implement of husbandry, possessing such superior utility, as this hoe harrow seems to me to possess, is deserving of being made known as generally and as speedily as possible. I conceive this would be best effected through the medium of your respectable Society, to whose notice I must entreat you to have the goodness to introduce this implement. Should they concur in opinion with me respecting it, I am persuaded that they will give a plate and description of it in their next volume.

Convinced that the fertility and productiveness of our arable grounds may be much increased by a more general practice of the horse-hoeing husbandry, I wish to see the practice of it advanced more nearly to perfection, as that must tend to promote its more general adoption.

I am, Dear Sir,
Your very humble Servant,
CHARLES WAISTELL.

No. 90, High Holborn,
To C. TAYLOR, M. D.
Secretary to the Society of Arts,
Adelphi, London.

Reference to the ENGRAVING *of Mr.* WAISTELL'S *Drill Horse Hoe Harrow,* Plate I. Fig. 3.

Fig 3. shows the hoe harrow to which the horse is to be attached by the upright iron *a*, in which are a number of holes to admit the drag chain to be put higher or lower as may be found necessary. This iron is at one end fixed firm in the fore-part of the machine at *b*, and at the other end to the further side or wing *c*.

d Is the nearer side or wing of the machine, and moveable by a joint at *e*. This wing may by this mean be expanded or contracted, as the interval between the rows to be cleared of weeds may require.

f, A strong wedge-like tooth in the fore-part of the machine to tear up the weeds, which are deep in the ground.

g, *g*, Other teeth more slender, fixed in the two wings or sides of the machine, and which are also intended to tear up weeds, and loosen the earth.

h, *h*, *h*, Three triangular hoes. That which is in front has a strong iron fixed in its centre; the two others at the hinder part of the machine have the irons fixed at the further corner of each. The intent of the centre hoe is to cut off the weeds on each side next the crop, and to lay all the weeds in a ridge-like form in the middle of the path, to dry and rot.

i, *i*, The two handles, by which the machine is managed.

k, A slender iron bar, with a peg and holes to direct the distance of the expansion or contraction of the machine.

l, A strong iron vice, which works in a grooved iron, fixed to the inner side of the wing *d*, and which, when screwed down, holds the machine firm at the distance of expansion wanted for use.

Fig. 4. Shows on a larger scale one of the hinder hoes separate from the machine, and the manner by which it may occasionally be raised or lowered in the machine by a pin and holes.

The Gold Medal *of the Society was this Session adjudged to* Richard Phillips, Esq. *of Tyn-y-Rhos, near Oswestry, for* Improving Waste-Land.—*Class* 45.

The following Accounts and Certificates were received from him.

SIR,

In the year 1804 the waste lands in the township of Bron-y-garth, in the parish of St. Martin in Shropshire, were divided and allotted by an agreement entered into by the proprietors of land, without any application to Parliament.

This township is separated from the county of Denbigh by Offa's Dyke, the boundary in ancient times between the kingdoms of Mercia and Wales: the boundary here, as in other uncultivated parts of the demarkation, still remains entire, after a lapse of 1000 years. Upon the ground, where the improvements detailed in my paper to you are made, the descendants of the ancient Britons fought for their independence, and for what remained of their territories. Upon this spot the bands of Henry II. headed by that monarch himself, were foiled in the battle of the Ceiriog by Owen Gwenydd, at the head of his brave Welshmen. The township on the west of Offa's Dyke, is called *Crogen*, i. e. *a place of graves*, because there the slain, who had fallen in battle, were buried. The posterity of the two, once hostile, nations, now contend which shall excel most in the arts of peace. This rude soil is now no longer fertilized by the blood of warriors, but by the united labours of Englishmen and Welshmen. The dyke is still pretty accurately the line which separates the two languages: Welsh is generally spoken on the western side; English on the eastern. The hills, of which these wastes form a part, are at least as high as any in the county. Mr. Archdeacon Corbet, in his account of the agriculture of the county of Salop, asserts, that the hills near Oswestry are the highest in Shropshire.

The lands in question are part of the same chain which composes the skirts of the Berwyn, a mountainous tract, extending widely over the west of Denbighshire, and the contiguous part of Merionethshire. As a traveller approaches this country from Shrewsbury, a line of highly elevated ground presents itself to his view, extending from near the Severn to the neighbourhood of Wrexham. This ground once formed the rampart of Wales, though now cultivation in several of its parts is softening the roughness of its aspect.

The continuity of the line of hills is broken by two principal valleys; the larger is that of Llangollen, through which the Dee flows: the other is watered by the stream of the Ceiriog. One part of the Bron-y-garth enclosure looks over the last-mentioned valley, and has a northern aspect; the other looks to the east, over the plains of Shropshire.

Lime is found in every part of the line which divides the mountains from the plains; on the frontier of North Wales. The beds of lime-stone in some places lie on sand-stone, and in other places are found below it. In others again the lime-stone is near the bottom of a hill, sand-stone occupies the middle space, and lime-stone is again found upon the summit.

In some respects the sand-stone works well, and is of a superior quality, as the aqueducts over the Dee at Ponteysyllty, and that over the Ceiriog at Chirk, sufficiently prove.

The sand-stone in the quarries, which furnished materials for building those aqueducts, is perhaps equal in beauty and durability to Bath or Portland stone; and the lime-stone, at least in one quarry near Oswestry, becomes a beautiful black marble. In the lands, spoken of below, the lime-stone supplied me with manure, and the sand-stone forms the larger portion of my fences.

The paper, which accompanies this letter, is drawn up in haste, because it was only very lately that I determined to be a candidate for the notice of your honorable Society. But all the parts are faithfully and accurately stated.

I am, Sir,
Your most obedient Servant,
RICHARD PHILLIPS.

Tyn-y-Rhos, near Oswestry, Jan. 1806.

To C. TAYLOR, M. D.

An Account of the Improvement of more than Ninety Acres of Land lying waste.

In the year 1804 a large quantity of waste land was divided and allotted in the township where I live, on the borders of North Wales, by private agreement. I became possessed, as proprietor, of 70 acres of these lands. I obtained 50 acres more by two leases, each for 21 years.

The wastes consisted of two divisions. The first was a piece of common land, surrounded by old enclosures. This portion, though raised far above the general level of the country, is much less elevated than the larger tract hereafter to be described.

The portion of this waste allotted to me was 8 acres. The grass produced, while the land was in its natural state, was a sour rough sort. It afforded pasture in the summer to a few cattle, horses, and sheep. The coldness of the soil, and the consequent bad quality of the grass, gave this common the Welsh name of *Rhos*, a name which implies a tract of moist land, producing a coarse sour herbage.

1. I began my improvements upon this allotment, because it lay near my house. The fence is a bank four feet high from the bottom of the ditch, with a double rail at the top. A double row of quick is planted upon the top of the fence, to supply the place of the rails when they decay.

The surface soil is about 6 inches deep, with a substratum of bad yellow clay. The first ploughing was in June 1804. It was cross-ploughed and harrowed in August; ploughed a third time about the 20th of September; manured about the end of the same month with 1690 bushels of lime, amounting to about 211 bushels an acre; ploughed a fourth time in the middle of October, in small butts or ridges; sown and harrowed. This operation of ridging was peculiarly necessary here to carry off the surface water, which had formerly greatly injured the land. Twenty-four bushels of Devonshire wheat were sown: the return was about 240 bushels (30 bushels an acre). The crop was one of the finest in the county. The expenses, as appear by the subjoined table, were £.88 19*s.* 1*d.* The wheat was worth last month £.130. The balance in my favour is £.40 0*s.* 11*d.* (£.5 2*s.* 7*d.* an acre.) This land in its natural state was not worth five shillings an acre. When it is laid down in grass it will be worth 40*s.* an acre.

In the beginning of October 1805, the stubble was harrowed off, and conveyed to the farm-yard. The land was then ploughed, sowed with 24 bushels of wheat, and harrowed as the year before. This is not my usual course of crops; but it was thought that old common land could not very easily be exhausted, and I was tempted to take another crop of wheat by the high price of corn, and by the circumstance of the land being for four years tithe free. The corn now, the 12th of January, is coming up in abundance.

It is my intention to lay down this lot with grass seeds, to be sown with oats in the spring of 1807. Oats I conceive to be the best grain for the next crop, because the land is not dry enough for turnips and barley.

The second, and much larger, division of lands lying waste extended along the side, and reaches the summit of a hill, which is equal in height to any in this county. The aspect is, for the most part, north and north east. A mountain torrent runs though the midst of this tract: some of the lands on one side of this torrent are more sheltered, and have a southern aspect.

Lime-stone is found on the lowest part of this waste, not far from the bed of a river: but the steepness of the ground above would have been too formidable an obstacle to the cultivation of the higher lands, had not lime-stone been discovered upon a spot so elevated, as to enable the improver to convey his manure, at a comparatively light expense, to the lands below.

The coals indeed, for burning the lime, are brought up a steep hill, a distance of four miles. The ascent up which they are conveyed, enhances considerably the expense of the manure.

Upon this waste the lime-stone is at the bottom of the hill, and fortunately upon the top also. The substratum, at no great distance from the surface, is sand-stone, in some places hard, in others loose, and less useful for fencing; a purpose to which I have applied it in dividing most of the enclosures.

All the waste lands allotted to me as proprietor, or occupied by me as tenant, in consequence of the two leases mentioned above, were covered for the most part with *gorse*, (Ulex Europæus,) in some parts of England called *furze*.

Some more favoured spots produced fern alone; and others were much encumbered with stones. The stones were carted off the lands to assist in making the fences; and those, which were too small for this purpose, were used to fill up large holes in various parts of the land.

The thin soil upon these wastes seems to have been created by the annual decay of portions of the gorse; a plant admirably calculated to produce, and afterwards to detain, in spite of rains and storms, the vegetable earth upon these steep declivities. Around each bush of gorse is always found a heap, more or less high, of excellent soil; and so completely do the prickles of this plant defend the grasses, that grow among it, from the attacks of sheep, that the earth, produced by the successive decay of vegetable matter, accumulates, and renders lands, which a few centuries ago would probably have been unproductive, proper for the growth of corn.

It is impossible to traverse our mountains without observing how wisely these things are contrived by Him who provides for us all.

The highest mountains of North Wales, where the rock does not every where appear, are clothed with heath. As ages roll by, the soil, produced by the annual decay of portions of the heath, becomes fit to produce gorse. If the water has a ready fall, and the land is dry, gorse appears in abundance on the more exposed sides of the mountains. Where soil has accumulated in sufficient quantities, the next protector and fertilizer of the mountains is fern. Where-ever this plant flourishes, still richer quantities of vegetable earth are every year added to the surface soil, and the ground is rapidly prepared for the plough.

Let me be excused for having made this digression longer than I intended.

I now proceed to state the operations performed upon the second portion of waste land improved by me.

2. One close of 21 acres, for which I have a lease for 21 years, at 10*s*. an acre, is so steep, that no waggon or cart can be used, to carry off the crop; drags must be employed for this purpose.

This land was so steep, and was encumbered with such a quantity of stones, that a respectable gentleman farmer, whose lands are contiguous to it, and to whom it was offered in exchange for other lands, declared he would not cultivate it if it were given him as a present. I should observe, that it was stipulated in my lease, that the landlord was to be at the whole expense of fencing.

The greater part of this land was begun to be ploughed for me in December 1804 by a neighbouring farmer at 20*s*. per acre. It was at first ploughed one way. The steepness of the ground made it necessary for the horses to drag the unencumbered plough to begin the furrow again upon the " vantage ground." Two acres of it could not at first be ploughed at all. Hand labour was here employed.

The difficulty of ploughing proved so great, that I thought it right to make some addition to the stipulated price of 20*s*. an acre. It was harrowed in June 1805. The whole of the field was cross ploughed in July; harrowed and manured in August with 5200 bushels of lime, about 250 bushels an acre. The quantity of lime generally used in this country is about one-fourth less than this. The lime was carted in small quantities, and laid upon the land with the assistance of three men with each team. So many men were necessary on account of the uneveuness of the ground.

The fence, made at my landlord's expense, consists of a wall six feet high, 20 inches broad at the base, and 14 at the top. It is to be pointed next summer with mortar. The materials were partly stones collected in the field, and partly sand-stone obtained from a quarry, opened for this purpose in an allotment to be described hereafter. The fencing is mentioned in this place, because it was in this part of the process that the stones were collected off the land. The land was ploughed a third time the first week in October; sowed with wheat, and harrowed. Three ploughings were thought sufficient for this land, because the soil is light and ragged. The depth of soil is here near eight inches. The substratum is a light yellow *rammel*, called in this country *cat-brain*. The sand-stone, which lies next below, does not appear near the surface, except in one small part of this field. The wheat sown was 71 bushels, above three bushels an acre. This large quantity of seed was thought necessary, on account of the lightness of the soil, and the exposed northern aspect. These plants now (January 12) look healthy; they are of a good colour, and equal in appearance and promise of a good crop to the wheats upon the best lands in the neighbourhood.

3. I obtained a like lease for 21 years of another lot of 12 acres from the same landlord at 10*s*. an acre. I may here remark, that by an error in laying out a road, nine and a half acres of this field belong to my landlord, the other part to me as proprietor. But the close is at present undivided, and the whole subject to the same management. The aspect is here S. E.; but the situation is much higher than that of the last mentioned lot.

This lot, like the last, was, by the terms of my lease, to be fenced by the landlord; but all the fences have been made under my superintendance. The whole fence would have been a wall, but the sand-stone rock on this part of the hill failed. Twenty-six roods are fenced with a stone wall, six feet high. Sixty-seven roods are fenced by a bank and ditch, faced on one side with stone, and protected above by posts and double rails. Upon the top of the bank hawthorn quick is set. Fifty-eight roods more, which complete the enclosure, are bounded by a very high old dyke. This boundary, however, is of such a sloping form, that some additional defence was necessary. A ditch is therefore sunk on the summit of the dyke, to the depth of five feet; in this are planted strong *staggers*, as they are here called, consisting of hazle, holly, thorns, and horse briers*.

The first ploughing was in February 1805: it was done by my own teams. We used four horses in each team. I will remark here, by the way, that my own teams ploughed, the first time over, all the lands which I have improved, except the last mentioned lot of 21 acres; and that the expense for oats only given to my horses the first nine months of my improvements was 70*l.* This lot was harrowed the beginning of June. The second ploughing was in July by hired teams; it was harrowed the second time in the beginning of September; limed with 3250 bushels of lime, allowing about 270 bushels to each acre. It was sown in the middle of October with 40 bushels of wheat, and harrowed. The wheat plants are come up in abundance, and look as healthy and promising as wheat on any lands in the country.

It has already been remarked, that upon these light loose soils, it is necessary to sow a larger than usual quantity of seed by the acre. The soil is here about nine inches deep, but remarkably loose and light. The substratum above the sand rock is the same rammel or cat brain, which is found under most of these wastes.

4. I obtained from another landlord a lease for 21 years of two other allotments, amounting together to 20 acres. By

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* So called, perhaps, because they are an excellent fence, when mixed with other underwood, against horses as well as sheep, and other animals.

the terms of my lease I am to pay no rent for the first seven years; for the remaining fourteen years the rent is to be 14*s*. an acre. The tenant is to make the fences at his own expense.

Sixty roods of the fence round the first of these two lots, which consists of 12 acres, is a stone wall six feet high; 30 roods, a strong ditch and bank faced, as in the last lot, with stone, and protected above with posts and a single rail. On the summit of the bank hawthorn quick is planted. A single rail was here thought sufficient, because it is a fence between two closes, not between a close and the road.

The first ploughing was in September 1804; this was the first lot after the Rhos above mentioned, upon which I employed my own teams. It was harrowed early in May 1805; cross ploughed in the beginning of June; harrowed immediately; limed in the same month with 3250 bushels of lime, the same quantity as in the last mentioned lot; ploughed a third time, and sown in the end of October, and harrowed. The quantity of wheat sown, as in the last lot, was 40 bushels. The soil is here partly sand upon the sand rock, and partly a light soil upon rammel. Hand labour was employed at a great expense upon a stony part of this lot, in quantity about three acres. The wheat plants upon this lot are of as promising an appearance as upon either of those above described.

5. The other lot of 8 acres, obtained by the last mentioned lease, is not yet enclosed. The labourers are now (13th January) employed upon the fence. It was ploughed in January 1805, and harrowed in the same month. It is now a fallow intended for pease. This lot would have been prepared for wheat and sown; but lime, in sufficient quantities for all my improvements, could not this year be obtained, at the only rock from which it could be conveyed at any reasonable expense to these lands.

I was induced to offer the rents above stated of 10*s*. and 14*s*. an acre (in the last case, the land to be for seven years rent free) because I was confident, that these wastes were capable of improvement. But in the natural state in which I found them, they were not worth 2*s*. an acre. They afforded pasture to a few half-starved sheep of the worst Welsh breed; and the sheep did more damage to the fences of the old enclosed lands in winter, and to the lands themselves, than could be compensated for by the profits, which their owners derived from them.

The closes now fenced and improved, are well worth a guinea an acre. A year ago they were not worth two shillings.

The improvements upon the first four lots, above described, are to a certain degree complete. They contain fifty-three acres of as fine green wheat, as any which this country contains.

6. A sixth close of thirty-two acres, allotted to me as proprietor, is fenced with a wall six feet high, and one hundred and ten roods in length: most part of the wall is pointed with mortar on the outside; the rest is to be pointed next summer. The lower part of this allotment is bounded by the fences of my old enclosed lands. On the exposed side, towards the N. W. a plantation is intended fifty roods in length, and twelve yards in breadth.

This close was almost entirely covered with gorse. There was, as I stated above, much of this plant upon the lands already described. My first operation was to stock up the gorse. I gave my labourers three guineas for this work, upon this lot only. They were also to have the gorse for their own use, which was partly used for fuel, and partly sold by them. They sold it at 5*s*. the cart load. I made an experiment upon five acres of this close, where a plough could not at first be used. After the gorse was stocked off, the land was pared and burned; and the ashes were spread. The plough could, after the land had been thus treated, though with some difficulty, be used. I ploughed it in June, 1805; harrowed it; ploughed it three times more; and sowed it, about the end of the same month, with turnip seed. There is now upon the land a fair average crop of turnips.

I also pared three acres more. Part of this was burned, and part was manured with dung. Where the dung was laid, the ground was trenched about nine inches deep; the sod was placed with the surface downwards within the trench. The dung was laid in moderate quantities upon the sod, and covered with about six inches of soil. Potatoes were then set in the beginning of May in rows. They were hoed twice. The produce was abundant.

The remaining 24 acres of this inclosure, were ploughed in February and March, 1805. Fourteen acres were, after one ploughing, sown with 71 bushels of black oats; 11 acres with pease; and three acres with summer vetches. The ground was then well harrowed. I had little land of my old enclosures this year in oats. It was my wish to try, whether a crop of this grain might be obtained, upon land so fresh and light as this, without manure, and with one ploughing. The first promise, however, of the oats, was so bad, when they began to appear above the ground, that I thought it best to throw some lime upon the land; which, if not so beneficial to the crop of oats, will be useful to any succeeding crop. I therefore manured 18 acres; viz. all the land where the oats were sown, and part of that sown with pease, with 4550 bushels of lime.

I obtained from the 71 bushels of oats, a return of 360 bushels; a clean, thin crop, intermixed, indeed, with a little fern. The pease and vetches produced but a poor return.

In the beginning of November my teams were not much employed. I sent them to try how this land would appear when ploughed up. I found the part which had been limed, remarkably mellow. I conceive that this favourable appearance, arose from the length of time that the lime had been upon the ground. I then procured several hired teams in addition to my own. It was all ploughed up by the twentieth of the same month; sown with 95 bushels of wheat and harrowed. The potatoe land was sown with wheat, at the same time. The six acres, which had not been limed, are to be manured with 240 bushels of soot. The soot is now in waggons upon the ground; and the first favourable day, it will be thrown upon the land as a top dressing.

This is the last field sown by me. The wheat plants are now (January 13) making their appearance above ground, and look well.

I intend this year to proceed with activity in the improvement of the following allotments, which still lie waste.

7. and 8. One of these lots of 25 acres I obtained in exchange for four acres and a half of old enclosed, arable land, detached from my farm, of much the same quality with other arable lands in this neighbourhood. This circumstance alone proves of how little value these waste lands were. These 25 acres were an object to me, as they lay contiguous to another of my allotments; and they are equal in goodness of soil to any upon this hill. After this land has undergone the process described in lots 2d and 3d, I hope to see these 25 acres of equal value, acre by acre, to the four and a half which I gave for them.

These 25 acres, as well as lot 8, 27 acres, allotted to me as proprietor, will be improved next summer.

9. Three acres of steep ground, that can never be cultivated, will be planted, this spring, with different kinds of forest trees.

The tables of expenditure are below. The return in the first lot has more than repaid all my expenses the first year; and the return promised by the three succeeding lots, is little less abundant.

If I am permitted to live another year, and to enjoy my usual health, I hope to see 148 acres of land, which was so lately almost intirely unproductive, covered with golden harvests, or adorned with thriving plantations.

LOT I.—8 Acres.

	1804.	£.	s.	d.
64	roods of fencing, at 7*s*. per rood	22	8	0
1	gate and posts	1	1	0
1690	Winchester bushels of lime, at 2½*d*. per bushel	17	12	1
	Carriage	5	4	0
	1st ploughing, 20*s*. per acre	8	0	0
	2d ditto 15*s*. per do	6	0	0
	3d ditto 10*s*. per do	4	0	0
	4th ditto 10*s*. per do	4	0	0
3	separate harrowings, at 15*s*. per acre—5 acres	6	0	0
24	Winchester bushels of wheat, at 11*s*. do	13	4	0
	Labour	1	10	0
	1805.			
1	ploughing and harrowing, at 15*s*. per acre	6	0	0
24	Winchester bushels of wheat, at 11*s*.	13	4	0

LOT II.—21 Acres—Fenced by Landlord.

85½	roods of stone walling, at 17*s*. per rood	72	13	4
3	gates, at 1*l*. 1*s*. each	3	3	0
5200	Winchester bushels of lime, at 2½*d*. per bushel	54	3	4
	Carriage	10	0	0

1st

		£.	s.	d.
1st	ploughing at 20*s.* per acre	21	0	0
2d	ditto.... at 15*s.* per do.	15	15	0
3d	ditto.... at 10*s.* per do.	10	10	0
3	separate harrowings, at 15*s.* per do.	15	15	0
71	Winchester bushels of wheat, at 11*s.* per bushel	39	1	0
	Labourers for stocking, levelling, clearing stones, and spreading lime.	15	5	2

LOT III.—12 Acres—Fenced by Landlord.

		£.	s.	d.
26½	roods of stone walling, 6 feet high, at 17*s.* per rood	22	10	6
67½	roods of fencing, with stone face, and double posts and rails, and hawthorn quick, at 10*s.* per rood	33	15	0
58	roods of sunk fence, 5 feet deep, and staggers on the top along the dyke, at 4*s.* 9*d.* per rood	13	19	6
2	gates and posts, at 1*l.* 1*s.* each	2	2	0
1st	ploughing, at 20*s.* per acre.	12	0	0
2d	ditto,.... at 15*s.* per do.	9	0	0
3d	ditto,.... at 10*s.* per do.	6	0	0
3	separate harrowings, at 15*s.* per acre	9	0	0
3250	Winchester bushels of lime, at 2½*d.* per bushel	33	17	1
	Carriage	6	5	0
40	Winchester bushels of wheat, at 11*s.* per bushel.	22	0	0
	Labourers, for stocking, levelling, and spreading lime	8	3	0

LOT IV.—12 Acres—Fenced by Tenant.

		£.	s.	d.
60	roods of stone walling, at 15*s.* per rood	45	0	0
30	ditto of fencing, with single posts and rails, on top, with hawthorn quick, at 9*s.* 4*d.* per rood.	14	0	0
2	gate and posts, at 1*l.* 1*s.*	2	2	0
1st	ploughing, at 20*s.* per acre	12	0	0
2d	ditto, ... at 15*s.* per do.	9	0	0

		£.	s.	d.
	3d ploughing, ... at 10*s*. per acre	6	0	0
3	separate harrowings, at 15*s*. per do.	9	0	0
3250	Winchester bushels of lime, at 2½*d*. per bushel	33	17	1
	Carriage	6	5	0
40	Winchester bushels of wheat, at 11*s*. per bushel	22	0	0
	Labourers, stocking, levelling, clearing, and spreading lime	14	8	6

LOT VI.—32 Acres.

		£.	s.	d.
110	roods of stone walling, 6 feet high, at 17*s*. per rood	93	10	0
6	ditto of fencing, at 9*s*. 4*d*. per rood	2	16	0
3	gates and posts, at 1*l*. 1*s*. each..............	3	3	0
	1st ploughing, at 20*s*. per acre............	32	0	0
	2d ditto,...... at 15*s*. per do	24	0	0
2	separate harrowings, at 10*s*. per acre	16	0	0
4550	Winchester bushels of lime at 2½*d*. per bushel.. .	47	7	11
	Carriage	8	15	0
71	bushels of oats, at 3*s*. 4*d*. per bushel..........	12	7	0
24	ditto of pease, at 5*s*. per bushel	6	0	0
8	ditto of summer vetches, at 6*s*. per bushel.....	2	8	0
240	ditto of soot, at 6*d*. per bushel..............	6	0	0
	Sowing the same, at 5*s*. per 100 bushels......	0	12	0
95	Winchester bushels of wheat, at 11*s*. per bushel	52	5	0
	Paring and burning 5 acres, for turnips, at 1*l*. 16*s*. per acre	9	0	0
2	extra ploughings, at 20*s*. per acre............	5	0	0
2	ditto harrowings, at 10*s*. per do..............	2	10	0
	Spreading the ashes at 2*s*. 6*d*. per do..........	0	12	6
5	pounds of turnip seed, at 1*s*. per pound........	0	5	0
2	hoeings, at 7*s*. per acre	1	15	0
150	roods of 8 yards- square of stocking, at 1*s*. per rood, for potatoes	7	10	0
	Paring 3 acres, at 1*l*. 6*s*. per acre............	3	18	0

La-

	£.	s.	d.
Labourers for clearing the gorse..............	3	3	0
Ditto levelling and spreading the lime........	5	15	0

LOT V.—8 Acres—A Fallow for Pease;
One Acre waste.

1st ploughing, at 20*s*. per acre..............	7	0	0
Harrowing, at 5*s*. per do....................	1	15	0
Total Amount £.	1073	1	0

The accuracy of the foregoing facts, and particulars, detailed by Mr. PHILLIPS, are attested by

J. W. BOURKE, Vicar of St. Martin's.
P. Mc KIERNAN, Churchwarden.
JAS. DONNE, Vicar of Llanyblodwel.
C. MORRALL, Bellmont.
W. MORRALL, Dynbran Hall.
RICHARD CROXON, Oswestry.

The SILVER MEDAL *of the Society was this Session voted to* Mr. WILLIAM CHEETHAM, *of Mellor-Moor, near Chapel-in-le-Frith, Derbyshire, for* CULTIVATING WASTE LAND; *which was bestowed as a Reward for the* LAUDABLE INDUSTRY, *exhibited in bringing this Land into Culture, and not for an Approbation of the particular Rotation of Crops adopted by him.*

SIR,

I HAVE taken the liberty of transmitting through your hands, to the Society for the Encouragement of Arts, &c. a detailed account of Improvements in Waste Land.

Mellor-Moor, Jan. 27, 1806. Yours respectfully,

C. TAYLOR, M. D. W. CHEETHAM.

In the year 1781 I purchased 11 acres of common waste land, a part of Mellor Moor in the county of Derby, for which I gave 51*l.* 1*s.* It was intirely uncultivated and uninclosed I first inclosed the spot with a stone wall five feet three inches high, which cost me about 1*s.* per yard. I next built two cottages on the land, which cost me 120*l.* I then pared the land, not by a machine and horses, but by manual labour; for it is impossible to effect it in any other way, so very stony and rough was the surface: the expense of this was about 18*s.* per acre. The next operation was that of burning, which I also performed myself. I then spread the ashes, and covered them with lime, at the rate of 100 loads per acre, of 10 pecks to the load. I then ploughed and sowed the land with oats, which yielded a good crop. The expense of ploughing was more than double that, which was incurred by my neighbours, whose land was in proper condition; and the harrowing, on account of the peaty nature of my land, was of thrice the usual expense, for with less labour a sufficient quantity of mould could not be procured to cover the grain.

Immediately after the crop was got in, I again ploughed the land, and left it in that state till the following spring, when I sowed it with oats as before, and found that by ploughing in the autumn I saved much labour in the harrowing, since a single harrowing was sufficient. From this sowing I had an extraordinary good crop.

In the following spring I ploughed the land again, and sowed oats and hay seeds: the oats yielded nearly as before. I then divided the land into three closes by a stone wall four feet high; two of which closes are now good meadow land, and the other pasture, which, with the above cottages, are now let for 20*l.* per annum clear rent.

2. In 1783 I purchased 88 acres contiguous to the former

parcel, and comprised in a ring fence of stone five feet three inches high; for this allotment I gave 360*l.*

About two acres of this land I turned over with the pick-axe and spade; for the irregular surface which it presented forbade the use of a push-plough. I then set potatoes, and had a tolerable crop; after which I sowed barley, which yielded remarkably well. Twelve acres more I pared, burned, and limed, as the first mentioned parcel, and at about the same expense. I ploughed them in September, and suffered the land to remain so till the following summer, when I sowed it with turnip seed, which gave upon the whole an indifferent crop. In the ensuing spring I again ploughed it, and sowed oats, which yielded an excellent crop. On the two following years I repeated the same crops, with as good success as before.

I now ploughed this portion of land with the other two acres, and sowed the whole with hay seed. I then divided the same into two closes by a stone wall four feet high. One of the closes is meadow land, containing about three acres; the other is pasture land. On this plot I built a house, and have let it, with the 14 acres, for £.35 per annum clear rent.

3. My next work was to fence five more acres with a stone wall as before. I pared, burned, and limed the land as in the last parcel; and after ploughing, sowed it with oats, which yielded a good crop. The following year I repeated the same, mixing hay seed with the oats, and had as good a crop as before. These five acres are now as good meadow land as any in the neighbourhood. Upon this plot I built a house and out-buildings, which I occupy myself.

4. I next pared, burned, and limed other 16 acres, which cost about the same as the first; after which I ploughed and sowed the land with oats three years successively. One

half of the land yielded every year a particularly good crop; the other not so good, owing, I believe, to that part of the land abounding with a gravelly kind of stone. The last time of sowing I mixed hay seeds as before. This plot is now divided into two closes by a stone wall like the others.

5. I then fenced in another plot of eight acres, using the same process as before; and, after ploughing and sowing the same with oats and rye-grass, had an excellent crop. These two last mentioned plots I also occupy myself, excepting what I let for £.10 per annum. Upon the remainder of which, and the five acres abovementioned, I have two milch cows, one heifer, three calves, two horses, and one colt.

I greatly prefer the method of paring, burning, and limeing, as well as ploughing in the autumn, to any other. Paring destroys the heath, with which the whole of the above land was covered at the first operation; besides it prepares the land, so that a team may come upon it in dry weather.

The first time of ploughing I could in general do as much with four horses in two days, as my neighbours, upon good arable land, could do with three horses in one day; and the second time about as much with four horses as they could with three in the same time.

I have made some experiments (upon small plots) of liming and manuring with black dung upon the heath, and found, that though the heath was eventually destroyed thereby, yet it required from seven to ten years for the effect, and even then only an indifferent pasture was made. Whereas by sowing oats and hay seeds, a good crop was produced the first year, and on the following a much better pasture was made than after the term of 10 years by the other mode. Upon the whole I prefer in peaty land ploughing four years successively. The first and second times of ploughing should be in the autumn; by which two-thirds, I suppose, of the labour in harrowing are saved, and the soil afterwards is as fit for ploughing, &c. as most others are, which have been in tillage a much longer time.

The difference in point of value between the meadow and pasture land is, I consider, in the proportion of four to one. The expense of liming at present is much greater than of late, from lime being now 16*d.* a load, while only a few years since it was much less.

I cannot say positively what was the expense of paring, burning, &c. as the whole has been done by the manual labour of myself and sons.

WILLIAM CHEETHAM.

Mellor Moor, April 25, 1806.

To C. Taylor, M. D.

A certificate of the truth of the foregoing statement has been received by the Society, signed by

M. Olerenshaw, Minister of Mellor.
Ralph Wood.
Ralph Bridge.
David Bridge.
Thomas Bowden, Assessor of the said land.
Thomas Olerenshaw, Constable.
Emanuel Wild, Overseer of the poor.
George Ferris.

The GOLD MEDAL *of the Society was this Session adjudged to* J. G. CALTHROP, *Esq. of Gosberton, Lincolnshire, for the* CULTIVATION *of* SPRING WHEAT,—*Class* 23.

The following Account and Certificates were received from him.

SIR,

I DO myself the pleasure of transmitting to you an account of spring wheat, which I have raised on an extent of 82 A. 14 P. of land in Gosberton Fen in Lincolnshire. The land has been inclosed nearly seven years.

I am, Sir, your obedient Servant,

J. G. CALTHROP.

Gosberton, January 18, 1806.
To C. TAYLOR, M. D.

The wheat was sown between the 25th of March and 6th of April 1805: but I have known wheat sown with great success as late as the 20th of May. It was reaped between the 1st and 14th of September.

The kind was the horned or rough eared spring wheat.

The land was ploughed once in broad ridges with the common Dutch plough; the seed was sown broad-cast; and the land was then harrowed twice with the single horse harrow.

EXPENCES.	*£.*	*s.*	*d.*		*£.*	*s.*	*d.*
Seed, 8 pecks per acre, 20 Qrs.	5	0	0	per Qr. .	100	0	0
Ploughing . . .	0	4	6	per acre .	18	9	0
Sowing . . .	0	0	6	per ditto .	2	1	0
Harrowing . . .	0	1	6	per ditto .	6	3	0

Weeding

	£	s.	d.		£	s.	d.
Weeding	0	1	0	per acre .	4	2	0
Leading . .	0	1	0	per quarter .	22	0	0
Stacking, thatching, & housing	0	1	0	per ditto .	22	0	0
Thrashing by machine	0	3	0	per ditto .	66	0	0
Boating to market	0	1	0	per ditto .	22	0	0
					£ 262	15	0

A.	P.	
42	14	Of the land is moor upon clay, and
40	0	moor upon sand.

The land was in a high state of cultivation: 51 acres 2 roods and 38 perches had borne turnips, and 30 acres 1 rood and 16 perches cole, the preceding year.

ACCOUNT OF THE PRODUCE.

Qrs.	ct.	st.		£.	s.	d.
413	1	3	Good wheat sold at 50*s.* per qr. . . .	1034	13	9
26	1	2	Refuse or hinder ends 25*s.* per ditto .	33	8	9
440	1	1		£.1068	2	6

Weight was 16 st. 4 lb. neat per comb, or 57 lb. per Winchester bushel.

The Reverend *William Barnes*, minister of Gosberton, and Messrs. *William Dods* and *Henry Syson*, churchwardens and overseers of the poor, certified that the above statement by Mr. *Calthrop* was correct.

The GOLD MEDAL *of this Society was this Session adjudged to* MR. JOHN SHUCKFORD WADE, *of Benhall, in the County of Suffolk, for* PLANTING OSIERS: *Class* 12.

The following Account and Certificates were received from him.

SIR,

THIS is to certify that JOHN SHUCKFORD WADE, of Benhall in the county of Suffolk, did plant, between the first of October, 1804, and the first of May, 1805, the undermentioned

mentioned parcels of land, with upwards of 12,000 sets of osiers per acre, of the species called New-kind and French; which are now in a thriving state, and fit for basket-making, having been an osier grower for these last twenty years.

		A.	R.	P.	
In Benhall, Suffolk.	One Meadow . .	5	3	19	called Goodings.
	Part ditto . . .	0	3	0	. . . Farnham.
	One ditto . . .	4	0	32	. . . Barn Piece.
In Gedgrave, a hamlet to Orford, in the same county.	. . .	4	3	0	. . . Further Piece.
		15	2	11	

Certified by Rev. Geo. Dinsdale, Vicar.
Jno. Ablett, Churchwarden.
Jno. Ablett, Overseer,
Thos. Pope,
Sam. Joller, } Inhabitants.
Francis Wilby, Basket-maker.

P. S. It may not be without use, to state some facts, with respect to osiers in our part of the country.

The names given to the osier plants which we cultivate are, *New Green Kind*, *Leathering Osier*, *French Rod*, *Mootely Rod*, and *Craneker*.

We plant the sets at a distance from each other, of 26 inches by 10. They generally grow best near our river.

The expense, as near as I can ascertain, for sets 9 inches long, from the but or largest part of the rods, is at least £.10 per acre; besides an additional expense of two guineas, for preparing the land in ploughing and harrowing, and in planting the sets.

In a quantity of land, a man will do well to make a net profit of £.10 per acre; for the plants are very subject to the depredations of insects. A brown bug attacks them, and this is followed occasionally by a black caterpillar, which makes them crooked, and entirely kills the top. I have had plants only knee deep, where previously they had been seven feet high. In order to net the sum I have mentioned, we must be nearly free from such ravages. New sets are continually required to replace such as fail. Upon the whole, then, I must consider £.10 as a full average net profit; under the proviso, however, of the price continuing what it is at present.

I had my osiers quite clean for the first two years. About eight years since I was obliged to stub up all my rods, or osiers, from the insects before mentioned being so numerous as to render them altogether unsaleable: even at this time I am not without my fears, such is the precarious state of osiers; though, as I have admitted, some years are more favourable than others.

Your obedient humble servant,

J. S. WADE.

Benhall, November 13, 1805.

To Dr. C. Taylor.

The Silver Medal, *or* Ten Guineas, *at the option of the Candidate, were this Session adjudged to* Charles Layton, Esq. *of Reedham Hall, in Norfolk, for his Comparative* Culture *of* Turnips.—*Class* 26.

Mr. Layton *preferred the honorary Reward.*

The following Communication was received from him.

SIR,

I beg leave to send you an account of an experiment on the comparative culture of turnips: and have the honour to be

Your very humble servant,

CHAS. LAYTON.

To Dr. C. Taylor.

Secretary to the Society of Arts. &c.

Being desirous of ascertaining by experiment, the best mode of cultivating turnips, I prepared in 1805, 20 statute acres of land well calculated for such trial. The whole spot was level, and the soil similar in every part. By manuring it equally with ten cart loads per acre of rotten farm-yard dung, after it had been properly summer tilled, it was fit, by the 24th of June, for the reception of the seed. In order to make the experiment perfectly accurate, I divided the field, which is square, into ten equal parts, and sowed the whole of them alternately by drill and broadcast at the same time. The drills were 12 inches asunder. The seed was of the white-loaf stock, and I had the satisfaction to find that no part failed. The divisions were all of them hoed at the same time, and care was taken to set the plants, as well the broadcast as the drilled, 12 inches apart. The expense for the whole was 7*s*. per acre; but from the drilled plants requiring an extra man and horse per acre, beyond the broadcast, I estimate the relative expense as 8 to 7. Sixteen perches of each were set out and weighed by three respectable farmers and graziers, who reside in the parish of Reedham, where the experiment was made; and who have set their names to the certificate sent herewith.

A certificate in proof of the above account was received by the Society, signed by

JOHN BAKER.
DAN. COCKERILL.
RT. LONG.

The certificate also states that

	T.	ct.	st.
16 Perches of the drilled crop weighed . . .	1	19	0
Ditto . . . of the broadcast.	1	14	4
	0	4	4

Difference in favour of the drill, 4 Cwt. 4 Stone.

CHARLES LAYTON.

ReedhamHall, Norfolk, Feb. 27, 1806.

The Thanks of the Society were this Session voted to Mr. JAMES DEAN, *of Exeter, for the following Communication of the Method of* PRESERVING TURNIPS *in the winter Season.*

SIR,

WHEN surveying an estate in the South-Hams of Devon, in February last, my attention was attracted by the singular appearance of a crop of turnips in an orchard; so thick as to touch each other, and closely surround the stems of the apple-trees. I enquired of the farmer the reason of so unusual a crop, and I received from him some curious information. It was the constant practice, he said, in his neighbourhood, for farmers, after they had broken up ley ground, first to take a crop of turnips; and in the autumn, or rather winter, to sow wheat in the same ground. Should winter fodder be scarce, they then preserved the turnip crop for stock, and consequently could not put in wheat before January; and even then with no probability of having more than two thirds of an usual crop; because of the late sowing. This was an evil of great magnitude, and led him, he added, to make trial of a mode peculiarly successful, enabling him to sow his seed in the proper season, and to save the most valuable of his turnip crop during the winter.

He got, he said, his turnip seed into the ground early in June; and in October, by which time the turnips would have grown to a large size, he had the largest of them drawn without injuring the leaves, and then placed close to each other on the grass in the orchard, in the same position in which they grew. Their leaves preserved them from external injury; and their tap roots put out, in a short time, other fibrous roots into the grass; which, in orchards, is generally long in the autumn; and thus the turnips were preserved good for use. I inquired

I inquired whether the turnips acquired any additional size after their removal into the orchard, and whether, from the warmth occasioned by the turnips to the ground, any advantageous effect was apparent in the apple trees. On these questions he was not able to speak positively, though he thought the turnips had increased in size; and he thought, likewise, that the crops of apples appeared larger, and the annual bearings more certain in the orchard I was observing, than in those where no turnips were put; though, till the time I spoke, he had not even guessed at the cause.

I have the honour of being,
with due respect,
your obedient servant,
JAMES DEAN.

Exeter, April 28, 1805.
To C. Taylor, M. D.
Secretary, &c.

The Silver Medal *of the Society was this Session voted to* Mr. Robert Salmon, *of Woburn, Bedfordshire, for his Remarks on* Pruning Fir Trees.

The following Communications were received from him, and an Engraving *is annexed, to explain the Advantages of the Method recommended.*

SIR,

I have the honour of transmitting to you some observations on the management of fir plantations. Having had the care for some time past of such plantations, and knowing how much they are increased in this kingdom, I considered it as a matter of importance that a proper mode of management should be generally known, in order to bring timber to the greatest attainable perfection. For this reason I have turned my thoughts to the subject, and am confident that much may be done, as is elsewhere asserted, by good management. I have collected several specimens to demonstrate the difference between good and bad management, and have made some observations which I have not before met with, and may perhaps be useful; you will have the goodness, therefore, to present these observations and specimens to the Society of Arts, and to believe me

Your very humble Servant,
Woburn, April 29, 1805. ROBERT SALMON.
To DR. C. TAYLOR.

Reference to Plate II. showing specimens of English grown Fir Timber, cut out of his Grace the Duke of Bedford's plantations at Woburn, pointing out the impropriety of leaving timber to the course of nature, and the loss and defects that arise from such mode of management; also illustrating the necessity of some fundamental rule for managing the same, and the advantage of early and close pruning off superfluous branches, with a general rule for performing the same, and regulating the distance of the plants in Fir Plantations.

Fig. 1. Section A. shows a dead knot and progress in the growth of the tree, having 19 years of growth below the bough, and 18 years above it. From the regular course of nature, as shown by this section, it is evident this bough or knot must have existed as long as the upper part of the tree, namely 18 years. For the first three years the growth and accumulation of the bough proceeded regularly with the tree; but about that time (now 15 years ago) the bough must have been distantly cut off, thereby preventing its regular increase in the part left remaining; for six years after cutting off, it appears to have barely existed, and after that ceased to exist at all but as a dead bough. Since it became so, nine years of accumulation has taken place on the

trunk of the tree, thereby gradually inclosing a part of the dead bough, which part so inclosed is what by joiners is properly called a dead knot; the boughs that exist and are inclosed whilst living, are the live knots, and these the tree will produce either as the bough may be distant or close cut from the tree. From this specimen may be determined, that if the bough had been cut close to the tree at four years growth, there would now have been sound clean wood over it to the outside: or when it was cut, if it had been taken off at ⊕, sound clean wood would have formed over it to the outside.

N. B. In all the specimens this mark ⊕ is affixed to point out the proper place for cutting off, and is so placed as to allow for thickness of bark at the time it should have been cut.

Section B. Shows a striking instance of the impropriety of leaving the smallest bough cut at a distance from the tree; this bough was cut off and became stagnant at two years growth, notwithstanding which it was 14 years before the wood on the trunk accumulated to the end of the dead knot.

Had this bough been cut at ⊕, the knot as far as that would have been firmly united with the tree, and above it all sound clean wood.

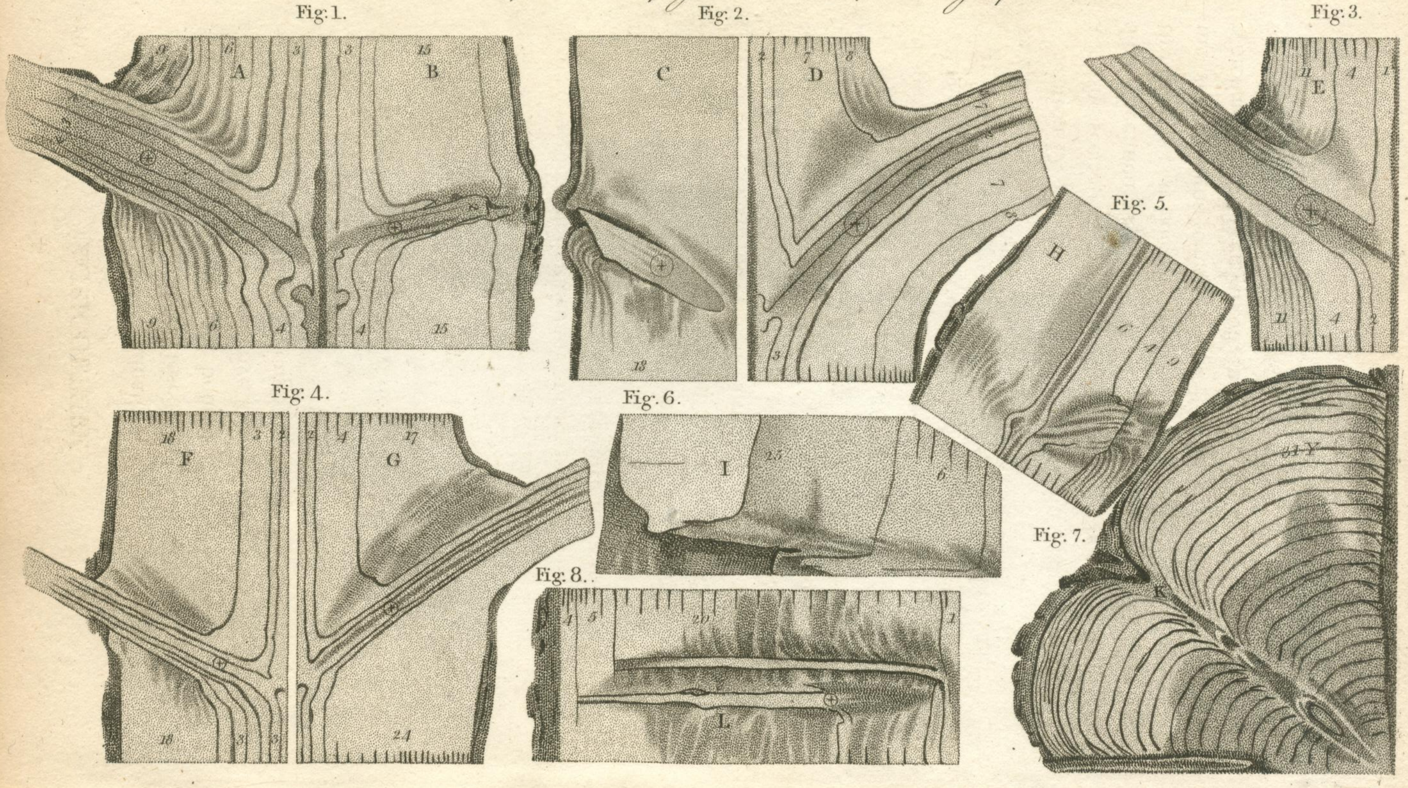
Fig. 2. Section C. Another instance of improper cutting. If it had been cut at ⊕, the timber would have been more valuable.

Section D. This before cutting exhibited a healthy bough, and the section shows it the same, exhibiting a live knot. This specimen clearly shows the progress of nature in healthy boughs; it also shows the great impropriety of suffering such boughs to exist more than five or six years, at which age, had it been cut off, instead of a knot and great defect there would have been clean wood from ⊕ to the outside

Fig. 3. Section E. Another striking proof of the impropriety of long cut boughs, a dead knot of many years standing, but

far

Mr. Salmon's Specimens of good & bad pruning of Fir Trees.



C. Varley del.

far from being inclosed now, admitting wet into the heart of the tree : its hould have been cut at ⊕ .

Fig. 4. Part of another Scotch fir.

Section F. A very striking proof of young and bad pruning. This bough was cut at four years growth, and now, after 18 years accumulation of the trunk, remaining uncovered, and would so have remained many years longer.

Section G. A bough which, whilst standing, appeared not vigorous or healthy ; the section shows that at six years it was in decline, and after that increased very little, though its increase may be distinctly traced to the present time.

This should years ago have been cut off.

Fig. 5. A very complete specimen of good pruning, though much too late.

Section H. A large bough cut off at six years growth, but so close cut, that in four years afterwards the wood on the trunk of the tree is arrived at the extremity of the knot.

Fig. 6 and 7. Parts of a Weymouth Pine Fir, 31 years growth, a most striking specimen, and complete refutation to the doctrine of those who contend that the best way is to leave plantations to prune themselves. This tree grew near the outside of a thick plantation securely fenced, and in a state of nature at the time it was felled, except some accidental breaking off a few boughs near the bottom of the tree. Before it was felled it indicated sickness by the foliage, but from what cause it was so, no trace appeared, as the trunk bore a very healthy appearance. The section shows, by the small increase of wood for the last six years, that it was not then healthy.

Section I. A dead knot from a bough broke off at six years growth ; since which 25 years growth of wood has formed on the trunk, without nearly covering the stump ; this stump was broke off before representation.

Fig. 7 is a horizontal section of three other knots cut from the ſame round as fig. 6, showing the great obstruction to the growth of the tree round the knots: this also explains the cause of the great hollow round the knot in fig. 6.

The knot at K is a most striking and undeniable proof of the impropriety of leaving the smallest bough for nature's disposal. This bough protruded beyond the tree some distance, and evidently never existed but in a stagnate state, for the last twenty-nine years; it being only two years old when it so became stagnate.

Fig. 8. A piece of the same tree as fig. 6 and 7; but from the next higher tier of boughs, having a small piece wasted between the two.

Section L. Two small boughs, the upper one only one year's growth, was twenty years before covered, and has nine years wood over it. The lower bough is of six years growth, was twenty years before covered, and has four years wood over it.

On contemplating these specimens; considering the purposes that fir timber is generally applied to, and having some knowledge of plantations of this sort, it must occur that clearness of knots, straightness, length and equal size of its trunk, constitute its perfection; and, if deficient in all these, it is of no value but for the fire. Next to these considerations, and the prospect of an improved knowledge of cultivating this article, it may be a fair question, if our own country is not capable of producing fir timber little or not at all inferior to the foreign fir.

At present fir in this country appears not for any period to have been considered much otherways than as ornamental. For this purpose they serve but for a certain time, which past, it has been their fate to be cut down long before having attained maturity. But from the vast plantations now established, it is to be hoped that another century may obtain to English Fir some of the character of the

English Oak; towards such end, if attainable, every means should be used, and towards which nothing appears more likely to succeed, than a well grounded general practical mode of management, from the time of their being planted out, to their greatest imaginable age of improvement. That a knowledge of such may by perseverance be gained, is not much to be doubted; and by inspecting and considering the specimens herein referred to, there appears great reason to conclude, that early and proper pruning and thinning will form a considerable feature in the system to be adopted.

Now as forms are first instruments in good systems, and that proceedings on fundamental principles (though in the essay they may a little err) are better, in a general view, than occasional success by hazard; so it may be warrantable that a system for general management may be laid down, although the author cannot possibly have lived to prove all by experience: so the rules hereafter submitted are given, being the result of only a few years observations.

For planting, from every authority or observation, there can be no doubt that all firs should be planted thick; not more than four or five feet apart.

Where firs of the same kind are planted together, there is less loss of plants from one sort overgrowing and destroying the others; consequently it appears advisable that all the different sorts be planted by themselves. If any admixture be at all admitted, the Scotch and larch may best succeed: but this is not certain, and they will certainly be best separate on two accounts; first, because they are not so likely to injure each other; and secondly, the larch may be put in the ground best suited to them, and the Scotch the same.

In making plantations of any particular sort, it may be right to have a few spruce, or other sorts on the outside, to prevent mischief from sudden gusts of wind; but if the situation is not subject to such gusts, the spruce had better be omitted, being mechanical agents only, and by excluding the sun and air they act against the operation of nature.

In these hints ornament is not considered; if such be wanted, and profit also, then the spruce, larch, silver, and some other may be combined.

From some years observations on pruning and the effects thereof, it appears certain that Fir trees, at a certain age, should be pruned to a certain height; and for regulating thereof, the following simple rule is recommended. The pruning to commence when the trees are six years old, or when there is discernible five tier of boughs and the shoot; the three lower tier of boughs are then to be taken off. After this first pruning, the trees to be let alone for four or five years, and then, and at every succeeding four or five years, the pruning to be repeated, till the stem of the tree be clear to forty feet high, after which, as to pruning, it may be left to nature. The rule for the height of pruning, after the first time, to be half the extreme height of the tree, till they attain twenty years growth; and after that time, half the height of the tree, and as many feet more as it is inches in diameter at four feet from the ground. This pruning is known from repeated observations, not to be excessive, and the rule is calculated to check the too tapering top, and strengthen the slender bottom by carrying the pruning to a greater proportionate degree, in a ratio compounded of the height and bottom bulk; and by this rule it may be observed, that the trees will be at top cloathed with somewhat less than half their branches. The proper time for pruning, is between September and April, and the tool to be used, the saw.

Orderly thinning the trees at certain periods is the next essential to pruning, and for this purpose observations have been made on the most orderly and thriving plantations, and the following simple rule is recommended. Keep the distance of the trees from each other equal to one-fifth of their height. In the application of this rule for thinning, it is evident that each individual tree can never be made to comply, for the original distance (even if planted in the most regular order) will allow only of certain modifications, by taking out every other tree, and so on; but even if the obtaining such equal distance was practicable, experience would show that another way should be preferred, of which the eye must be the judge, by taking out such trees as are least thriving, stand nearest another good tree, &c. &c.; at the same time keeping in view the rule prescribed: the following of which rules may easily be proved by measuring a chain square, or any quantity of the land, and counting the trees thereon; then by trying the height of two or three trees in that quarter, and taking one-fifth of such for the distance, it would be readily seen how many trees should be contained in the piece measured: or the practice may more simply be regulated, by taking the distance of eight or ten trees added together, the average of which should be equal to a fifth of the height of the trees.

In these rules nothing impracticable or complicate is proposed.

The author has for years known the expense, and produce from trimming only, and finds in Bedfordshire the produce doubly repays the expense; and although some experimentalists may differ from him, or time may show some reason for deviating somewhat from his rule, yet it is presumed all will agree that some simple system is advisable, instead of having plantations and woods mismanaged, to the great loss of the community and the proprietors. If such a system as proposed, be generally promulgated; if not perfect, it will most likely, in time, become so, and thereby have its advantage; and that some advantage may be had in speculation, the following concluding remarks are introduced.

In the common course of gardening, it is understood that pruning invigorates the tree; that trimming off the side branches makes the upright ones shoot the stronger, and by cutting out the dead and decayed wood the tree is kept alive: some of this doctrine will certainly apply to the tribe of firs; it will certainly substitute clean wood for knots, and of all this treatment, from their particular uses, they of all other trees stand in most need, and will be most improved by it. And should it be admitted that like treatment would on the fir, as well as other trees, produce the like effect, it would lead to a well-grounded expectation that, as well as producing clearness from knots, straightness and length, the same operation would advance the quality nearer to that of foreign fir; for it may be traced, that where trees are tall and clear of boughs or knots, the whole substance of the wood is better and of finer grain, and it appears likely that such will always be the case: the reason may probably be inferred from the sap having farther to rise and descend, and having no boughs to divert or delay it, the circulation must be more fine and rapid, most increase be left in the neighbourhood of the boughs at the top of the tree, and least on the sides at the lower part; consequently adding to the length of the head, and rendering more fine each annual increase to the body; thereby producing a close-grained, clean, long, and regular, easy-tapering useful piece of timber; instead of a coarse-grained, short, sudden-tapering trunk, with a quantity of boughs and knots.

The foregoing observations and rules are meant to apply to fir timber only, but to a certain degree they may be applied to other timber; though by no means to the same extent, or age. But if applied as far as the first fourteen years of their growth, and then the pruning altogether omitted, and the thinning-out very much increased, any plantation would be rendered much more valuable than if left entirely to nature.

ROBERT SALMON, Surveyor.

Woburn, April 2, 1806.

I hereby certify that in the year 1804, having directed Mr. ROBERT SALMON, to collect proofs as to the advantage of pruning and managing my fir plantations in this neighbourhood: accordingly, in January 1805, he produced several specimens, with his remarks thereon; both of which, I am of opinion, do convey a proof of the necessity and utility of attention and management in the growth of fir, and of timber in general; and such specimens, I think likely to be useful to the public, and worthy the attention of the Society for Encouragement of Arts, Manufactures and Commerce.

BEDFORD.

Woburn Abbey, March 22, 1806.
To Dr. C. TAYLOR.